

[https://study.com/academy/lesson/physical-models-scale-models-life-size-models.html#:~:text=A %20scale%20model%20is%20a,that's%20only%203%20meters%20tall](https://study.com/academy/lesson/physical-models-scale-models-life-size-models.html#:~:text=A%20scale%20model%20is%20a,that's%20only%203%20meters%20tall).

SPECIAL EFFECTS

In special effects, a scaled model refers to a smaller-sized replica of a larger object or scene. These models are meticulously crafted to mimic the appearance of the real thing in detail. They're commonly used in filmmaking, particularly for scenes where creating or manipulating a full-size object or environment would be impractical, too expensive, or impossible due to logistical constraints.

Scaled models serve various purposes in special effects:

1. **Cost-effectiveness:** Building a scaled model is often more economical than constructing a full-size version, especially for elaborate or large-scale sets or objects.
2. **Detail and control:** Miniature models allow for precise control over every aspect of the scene, enabling artists to add intricate details and manipulate lighting and camera angles with greater ease.
3. **Safety:** For scenes involving hazardous conditions or stunts, using scaled models can eliminate risks to human actors or expensive equipment.
4. **Realism:** Despite being smaller in scale, well-crafted models can appear highly realistic on camera, especially when combined with other visual effects techniques like compositing.

Scaled models can represent anything from buildings and landscapes to spaceships and creatures. They're often used in conjunction with other special effects techniques, such as green screen compositing and CGI, to create seamless and convincing scenes in film, television, and advertising.

Scale model

A **scale model** is a [physical model](#) which is [geometrically similar](#) to an object (known as the [prototype](#)). Scale models are generally smaller than large prototypes such as vehicles, buildings, or people; but may be larger than small prototypes such as anatomical structures or subatomic particles. Models built to the same scale as the prototype are called [mockups](#).

Scale models are used as tools in [engineering](#) design and testing, promotion and sales, filmmaking special effects, military strategy, and hobbies such as [rail transport modeling](#), [wargaming](#) and racing; and as toys. [Model building](#) is also pursued as a hobby for the sake of [artisanship](#).

Scale models are constructed of [plastic](#), wood, or metal. They are usually painted with [enamel](#), [lacquer](#), or [acrylics](#). Model prototypes include all types of vehicles (railroad trains, cars, trucks, military vehicles, aircraft, and spacecraft), buildings, people, and science fiction themes (spaceships and robots).

Methods

Models are built to [scale](#), defined as the ratio of any linear dimension of the model to the equivalent dimension on the full-size subject (called the "prototype"), expressed either as a ratio with a colon (ex. 1:8 scale), or as a fraction with a slash (1/8 scale). This designates that 1 inch (or centimeter) on the model represents 8 such units on the prototype. In English-speaking countries, the scale is sometimes expressed as the number of feet on the prototype

corresponding to one inch on the model, e.g. 1:48 scale = "1 inch to 4 feet", 1:96 = "1 inch to 8 feet", etc.

Models are obtained by three different means: [kit assembly](#), [scratch building](#), and collecting pre-assembled models. Scratch building is the only option available to structural engineers, and among hobbyists requires the highest level of skill, craftsmanship, and time; scratch builders tend to be the most concerned with accuracy and detail.^{[\[citation needed\]](#)} Kit assembly is done either "out of the box", or with modifications (known as "[kitbashing](#)"). Many kit manufacturers, for various reasons leave something to be desired in terms of accuracy, but using the kit parts as a baseline and adding after-market conversion kits, alternative decal sets, and some scratch building can correct this without the master craftsmanship or time expenditure required by scratch building.

Purposes



A PIA plane scale model on display at Karachi Airport

Scale models are generally of two types: *static* and *animated*. They are used for several purposes in many fields, including:

Hobby

Most hobbyist's models are built for static display, but some have operational features, such as railroad trains that roll, and airplanes and [rockets](#) that fly. Flying airplane models may be simple unpowered gliders, or have sophisticated features such as [radio control](#) powered by [miniature methanol/nitromethane engines](#).

Slot car racing

Cars in 1:24, 1:32, or HO scale are fitted with externally powered electric motors which run on plastic road track fitted with metal rails on slots. The track may or may not be augmented with miniature buildings, trees, and people.

Wood car racing

Children can build and race their own gravity-powered, uncontrolled cars carved out of a wood such as pine, with plastic wheels on metal axles, which run on inclined tracks.

Wargaming

Miniature wargames are played using miniature soldiers, artillery, vehicles, and scenery built by the players.

Television and film production

Engineering

Structural

For structural engineering scale models, it is important for several specific quantities to be scaled according to the theory of similitude. These quantities can be broadly grouped into three categories: *loading*, *geometry*, and *material properties*.

Aerodynamic

Aerodynamic models may be used for testing new aircraft designs in a [wind tunnel](#) or in free flight. Models of scale large enough to permit piloting may be used for testing of a proposed design.

Architectural



[Han dynasty](#) pottery model of a pig pen

Architecture firms usually employ model makers or contract model making firms to make models of projects to sell their designs to builders and investors. These models are traditionally hand-made, but advances in technology have turned the industry into a very high tech process than can involve Class IV [laser cutters](#), five-axis [CNC machines](#) as well as rapid prototyping or [3D printing](#). Typical scales are 1:12, 1:24, 1:48, 1:50, 1:100, 1:200, 1:500, etc.

Advertising and sales

Military



Model ships and castle

With elements similar to [miniature wargaming](#), [building models](#) and [architectural models](#), a plan-relief is a means of geographical representation in relief as a scale model for military use, to visualize building projects on fortifications or campaigns involving fortifications.

In the first half of the 20th century, navies used hand-made models of warships for identification and instruction in a variety of scales. That of 1:500 was called "teacher scale." Besides models made in 1:1200 and 1:2400 scales, there were also ones made to 1:2000 and 1:5000. Some, made in [Britain](#), were labelled "1 inch to 110 feet", which would be 1:1320 scale, but are not necessarily accurate.

Manned ships

Many research workers, hydraulics specialists and engineers have used scale models for over a century, in particular in towing tanks. Manned models are small scale [models](#) that can carry and be handled by at least one person on an open expanse of water. They must behave just like real ships, giving the shiphandler the same sensations. Physical conditions such as wind, currents, waves, water depths, channels, and berths must be reproduced realistically.

Manned models are used for research (e.g. ship behaviour), engineering (e.g. port layout) and for [training in shiphandling](#) (e.g. [maritime pilots](#), masters and [officers](#)). They are usually at 1:25 scale.

Materials

Models, and their constituent parts, can be built out of a variety of materials, such as:

Plastic

This includes [injection molded](#) or extruded plastics such as [polystyrene](#), [acrylonitrile butadiene styrene](#) (ABS), [butyrate](#), and clear acrylic and [copolyester](#) (PETG). Parts can also be [cast](#) from [synthetic resins](#).

Wood

[Pine](#) wood is sometimes used; [balsa wood](#), a light wood, is good for flying airplane models.

Metal

Aluminum or brass can be used in tubing form, or can be used in flat sheets with [photo-etched](#) surface detail. Model figures used in wargaming can be made of [white metal](#).

Glue

Styrene parts are welded together using [plastic cement](#), which comes both in a thick form to be carefully applied to a bonding surface, or in a thin liquid which is applied into a joint by [capillary action](#) using a brush or syringe needle. [Ethyl cyanoacrylate](#) (ECA) aka "super-glue", or fast-setting [epoxy](#), must be used to bond styrene to other materials.

Paint

Glossy colors are generally used for car and commercial truck exteriors. Flat colors are generally desirable for military vehicles, aircraft, and spacecraft. Metallic colors simulate the various metals (silver, gold, aluminum, steel, copper, brass, etc.)

Decals

[Decals](#) are generally applied to models after painting and assembly, to add details such as lettering, flags, insignia, or other decorations too small to paint. Water transfer (slide-on) decals are generally used, but beginner's kits may use [dry transfer](#) stickers instead.

Subjects

Vehicles

Trains



Gauge vs scale

Model railroads originally used the term [gauge](#), which refers to the distance between the [rails](#), just as full-size [railroads](#) continue to do.

Aircraft



Scale model of a [Douglas DC-3](#) in [Finnair Airlines](#) colors.

Rockets and spacecraft

Model rocketry dates back to the [Space Race](#) of the 1950s. The first [model rocket engine](#) was designed in 1954 by [Orville Carlisle](#), a licensed [pyrotechnics](#) expert, and his brother Robert, a model airplane enthusiast.^[14]

Cars

Buses and trucks

Construction vehicles



A [model construction vehicle](#) (or [engineering vehicle](#)) is a scale model or [die-cast toy](#) that represents a construction vehicle such as a [bulldozer](#), [excavator](#), [crane](#), [concrete pump](#), [backhoe](#), etc.

Robots

Live action figures

Scale models of people and animals are found in a wide variety of venues, and may be either single-piece objects or kits that must be assembled, usually depending on the purpose of the model. For instance, models of people as well as both domestic and wild animals are often produced for display in model cities or railroads to provide a measure of detail or realism, and scaled relative to the trains, buildings, and other accessories of a certain line of models. If a line of trains or buildings does not feature models of living creatures, those who build the models often buy these items separately from another line so they can feature people or animals. In other cases, scale model lines feature living creatures exclusively, often focusing on educational interests.

Model kits of [superheroes](#) and [super-villains](#) from popular franchises such as [DC Entertainment](#) and [Marvel Entertainment](#) are also sold, as are models of real-world celebrities, such as [Marilyn Monroe](#) and [Elvis Presley](#).

One type of assembly kit sold as educational features skeletons and anatomical structure of humans and animals. Such kits may have unique features such as glow-in-the-dark pieces. Dinosaurs are a popular subject for such models. There are also [garage kits](#), which are often figures of [anime](#) characters in multiple parts that require assembly.

Ships and naval war-gaming



Scale down Model of Madagascar ship displayed at Surat castle
(fort)

Tanks and wargaming

Engines

[Kits](#) for building an engine model are available, especially for kids. The most popular are the [internal combustion](#), [steam](#), [jet](#), and [Stirling model engine](#). Usually they move using an [electric motor](#) or a [hand crank](#), and many of them have a transparent case to show the internal process in action.

Buildings

House portrait

Miniatures in contemporary art

